

ORAL CONTRIBUTIONS

805 Electron Beam Computed Tomography: Epidemiology and Relation to Plaque Burden

Monday, March 18, 2002, 9:15 a.m.-10:30 a.m.
Georgia World Congress Center, Room 255W

9:15 a.m.

805-1

Ethnicity and Calcified Atherosclerosis: Can Data on Coronary Calcium Be Applied Evenly Across Ethnic Groups? Results From the Prospective Army Coronary Calcium Project

Timothy C. Lee, Patrick G. O'Malley, Irwin Feuerstein, Allen J. Taylor, *Walter Reed Army Medical Center, Washington, Dist. of Columbia.*

Background: Black Americans have more prevalent coronary risk factors and experience greater rates of incident coronary heart disease than white Americans. Coronary artery calcium (CAC), a specific marker for coronary atherosclerosis that is quantifiable with EBCT, is increasingly used to indicate cardiovascular (CV) risk. However, whether existing data should be evenly applied across ethnic groups is unclear because black and white Americans may differ in their prevalence of CAC. This study examines the prevalence of CAC on EBCT across different ethnic groups among asymptomatic, active-duty personnel in the Prospective Army Coronary Calcium (PACC) Project.

Methods: Among 1000 consecutive participants, 989 (mean age 42 ± 2 yrs; range 40-45 yrs) indicated a specific racial affiliation. This included white, nonhispanic in 695 (70.3%) and black, nonhispanic in 194 (19.6%). Univariate associations between race and CV risk variables were entered into a logistic regression model for CAC, controlling for race and socioeconomic status.

Results: CAC was nearly twice as prevalent in white (19.3%) than in black participants (10.3%; $p=.003$) between the ages of 40 and 45 yrs. Blacks had different CV risk profiles, including a greater prevalence of hypertension, (17.7% vs. 6.6%; $p<.001$), LVH (13.3% vs. 4.1%; $p<.001$), ST-T wave abnormalities (18.1% vs. 3.8%; $p<.001$), and former cigarette smoking (16% vs. 5.2%; $p<.001$). Black subjects also had significantly greater diastolic BP, HDL, glycosylated hemoglobin, lipoprotein (a) and fibrinogen levels, and lower triglyceride and waist girth than white subjects. After adjustment for these differences, and including socioeconomic adjusters, logistic regression revealed white race, and higher body mass index and triglyceride levels remained statistically significant predictors of CAC.

Conclusions: CAC is less prevalent in black than in white Americans, and this difference is unexplained after adjusting for differences in CV risk factors and socioeconomic status. These differences imply that the use of EBCT as an accurate risk prediction tool in black Americans will require ethnic-specific data on the presence and severity of CAC.

9:30 a.m.

805-2

Sub-Clinical Atherosclerosis in Hypertensive Individuals: The Role of Conditional Risk Factors

Ifkhar J. Kullo, Joseph P. McConnell, Lawrence F. Bielak, Patricia A. Peyser, Sharon L. Kardia, Patrick F. Sheedy, II, Eric Boerwinkle, Stephen T. Turner, *Mayo Clinic, Rochester, Minnesota, University of Michigan, Ann Arbor, Michigan.*

Background: The ability of 'conditional' risk factors [lipoprotein (a), fibrinogen, homocysteine, triglycerides, small-dense LDL, and C-reactive protein] to predict the presence and extent of sub-clinical atherosclerosis is poorly understood.

Methods: We studied the relationship between conditional risk factors and quantity of coronary artery calcification (CAC) as determined non-invasively by electron beam computed tomography among 168 hypertensive siblings recently re-examined in the community-based Genetic Epidemiology Network of Arteriopathy (GENOA) study. The 10-year Framingham risk score was calculated based on conventional risk factors and the CAC score was calculated by the method of Agatston. Population-averaged generalized estimating equations (GEE1) were used to assess the association between the log-transformed CAC score and conditional risk factors while allowing for the familial correlation in these siblings.

Results: Framingham risk score was significantly associated with quantity of CAC ($p<0.01$). After adjusting for Framingham risk score, homocysteine was the only independent significant predictor of the quantity of CAC among the conditional risk factors ($p<0.029$). One standard deviation increase in homocysteine was associated with a 1.34 multiplicative increase in the quantity of CAC.

Conclusion: In hypertensive individuals, homocysteine levels are significantly correlated with the extent of sub-clinical atherosclerosis. This suggests a pro-atherogenic role for homocysteine in hypertensive individuals.

805-3

Plasma Homocysteine and Not C-Reactive Protein Predicts Progression of Atherosclerosis

Margaret Leila Rasouli, Matthew J. Budoff, Robert Park, Douglas Aziz, *Harbor-UCLA, Torrance, California.*

Background: Despite the availability of effective preventive therapies, coronary artery disease (CAD) remains the leading cause of morbidity and mortality. Use of traditional cardiovascular risk factors is imprecise and predicts less than one half of future cardiovascular events. Three potential means of identifying subclinical atherosclerosis and predicting future cardiovascular events are electron-beam computed tomography (EBT), homocysteine (HCY), and C-reactive Protein (CRP). Given the evidence that HCY and CRP are involved in atherogenesis, we hypothesized that significant progression of EBT calcium score (a measure of atherosclerotic plaque burden) is associated with higher levels of these markers. **Methods:** We enrolled 65 asymptomatic patients (49 male, 16 female, age 62 ± 9 yr) who underwent previous EBT calcium score testing at Harbor-UCLA 9-36 months previously and whose prior test scores fell within the low to intermediate range (scores between 5-200). Exclusion criteria included those with established symptomatic CAD and chronic renal disease. During enrollment, we measured risk factors, measured serum HCY, lipid panel, ultrasensitive-CRP, elicited personal history such as medication use, family and smoking history, and repeated their EBT calcium scan. Statistical analysis was performed using probable Chi square method, T Test, and multivariate analysis. **Results:** Study subjects with HCY level ≤ 12 (median) exhibited a mean yearly progression in coronary calcium of $12.6 \pm 9.3\%$ ($N=33$), compared to $29.9 \pm 26.8\%$ for those subjects ($N=32$) with HCY value > 12 ($p<0.01$). Patients with CRP ≤ 0.07 ($N=33$) had a mean yearly progression of $17.6 \pm 24.4\%$, compared to $24.6 \pm 26.6\%$ for those with CRP value > 0.07 ($p=0.28$). Neither cholesterol values (including LDL and HDL cholesterol), body mass index, gender, age nor presence of individual risk factors predicted progression of coronary calcium. **Conclusion:** Presence of elevated HCY (>12) strongly and independently predicts progression of coronary plaque burden.

10:00 a.m.

805-4

Coronary Calcifications in Young Patients With First, Unheralded Myocardial Infarction: A Risk Factor Matched Analysis by Electron Beam Tomography

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Electron beam tomography (EBT) is a sensitive tool for the detection of coronary calcifications. The purpose of this study was to assess the presence and extent of coronary calcifications in young patients with first acute myocardial infarction (AMI) in comparison to matched controls without a history of coronary artery disease (CAD).

Methods: In 102 patients below 60 years of age (19-59y., mean 40.1 ± 1 , 91% male), EBT was performed 5-10 days after unheralded, first AMI before coronary intervention. Coronary calcification was quantified using the "Agatston Score". Age-related calcium percentiles were determined based on the "Epidemiology of Coronary Calcification Study", Mayo Clinic, Rochester, and results were compared to a group of 102 controls without CAD matched for gender, age and risk factors.

Results: Calcifications were present in 96/102 patients with AMI (96%) and 59/102 controls (59%; $p<0.01$). The mean calcium score was 529 ± 903 in AMI patients vs. 119 ± 213 in controls ($p<0.001$). An Agatston Score above the 50th percentile was present in 90/102 AMI patients and in 47/102 controls (90% vs. 46%, $p<0.01$), above the 90th percentile in 62/102 patients and in 6/102 controls (62% vs. 5%), $p<0.001$.

Conclusion: In young patients with first, unheralded AMI, presence and extent of coronary calcification is significantly greater than in matched controls. However, the culprit vessel is not calcified in all cases and the overall amount of calcium can be very low while usually, the amount of calcium corresponds to a high age-related percentile.

10:15 a.m.

805-5

What Is the Relationship Between Extent of Calcification and True Atherosclerotic Burden In Vivo? A Volumetric Intravascular Ultrasound Analysis

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Pathology studies have suggested that the extent of coronary calcium correlates with the atherosclerotic burden. EBCT is used to screen for coronary calcium as a surrogate for atherosclerosis but prior in-vivo validations used angiography, which can only assess stenosis severity and not overall atherosclerosis burden. Using volumetric intravascular ultrasound (IVUS) in 19 patients with a focal RCA stenosis, we assessed the true correlation between the degree of calcification and overall plaque burden. IVUS measurements of the external elastic membrane (EEM) cross sectional area (CSA), lumen CSA, and plaque media (EEM minus lumen) CSA, and arcs of calcium were obtained using computerized planimetry every mm throughout the RCA from crux to ostia and volumes were calculated. **Results:** There was volumetrically more calcium in the nonstenotic segments than in the stenosis ($28 \pm 28 \text{ mm}^3$ vs $9 \pm 14 \text{ mm}^3$, $p=0.0055$). There was a significant correlation of atherosclerotic volume with a volumetric measure of calcium: $p=0.011$ in all segments, $p=0.0091$ in the stenoses, and $p=0.096$ in the nonstenotic segments. **Conclusions:** Although the maximum arc of calcium may be greater in the stenotic lesion